PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 31 NOVEMBER, 1929 No. 8

A PRELIMINARY GENERIC ARRANGEMENT OF THE PALM BRUCHIDS AND ALLIES (COLEOPTERA) WITH DESCRIPTIONS OF NEW SPECIES.

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In January, 1829, Dr. E. A. Back, in charge of Stored Product Insect Investigations in the United States Department of Agriculture, showed me two palm bruchids from Brazilian babassu nuts under investigation in his office. Having already given considerable attention to this group, I asked permission to study them. On comparing them with the material in the United States National Museum, both species were found to be already represented there and in addition to these there were representatives of five other species so closely allied to one of them as to make it necessary to treat them together. Unfortunately the condition of the literature of the group does not enable the described species to be determined with certainty and types or other authentically named material are not to be found in this country. Dr. Back and Dr. Cotton have prepared a paper upon these two bruchids and needed names for them. The present paper has been prepared to supply this need, to describe characters not previously used to distinguish species in the group, and to establish in the literature the genera into which the palm bruchids have differentiated.

Opportunity for type study being not yet afforded, I have ventured to describe the species as new believing it will be easy to sink any species found synonymous after the study of types. It is more difficult to clear up confusion caused by misidentifications.[1]

The types of the species here described are to be found in the United States National Museum, Washington, D. C.

Genonyms and Genera of Palm Bruchids and Allies.

The species of Bruchidae breeding in the seeds of many American palms have been considered as belonging in a single

[1]I have appreciated the opportunity to work on these interesting Bruchidae, particularly as it associates my work with the economic aspects and illustrations discussed in the paper previously referred to.

genus, in which have been included several Old World species, none of which are known to attack palm seed. The first genonym applicable to this group is *Pachymerus* Thunberg 1805, a monobasic genus based upon *Dermestes bactris* Johansohn 1763 (usually cited as of Linnaeus). The second was *Caryedon* Schoenherr 1823, with the originally designated genotype *Bruchus serratus* Olivier 1790, which has largely been lost sight of. In 1833 Schoenherr suppressed *Caryedon*, erected the "Grex" *Caryoborus* in *Bruchus* with the designated genotype *Bruchus serripes* Sturm 1826, including in it *bactris* and *serratus* and applied the genonym *Pachymerus* to another "Grex" with the designated genotype *Bruchus brasiliensis* Thunberg, which is not congeneric with any of the species referred to. This arrangement of the palm bruchids and the Old World "*Caryoborus*" was universally followed until 1913, when Pic restored *Pachymerus* for the group, listing *Caryedon* as a subgenus without indicating its application to species. Careful study of the Bruchidae of the National Museum has convinced me that the Old World species are not congeneric with the palm bruchids and must form a separate tribe. The palm bruchids separate naturally into three genera and form a compact tribe. These tribes with a third composed of *Caryopemon* Jekel 1855 and *Diegobruchus* Pic 1913 form a natural subfamily of the Bruchidae.

Pachymerinae (new subfamily).

Mesepimeron free, not fused with the mesepisternum, broadly attaining the trochantin extension of the mesocoxal cavity, but little or not at all narrowed beneath; pronotum flattened, flanks separated from dorsum by a marginal carina subtended on the dorsum by an impressed line, completely surrounding the dorsum or both obsolete anteriorly on the sides in *Caryedon;* anterior angles but little deflected toward the front coxae; front and middle tibiae with small equal paired calcaria concealed in the dense lustrous fulvous appressed hairs covering the tibiae toward the apex; front and middle tarsi with first and second joints triangularly widened toward apex and with the expanded lobes of third joint bearing dense fulvous plantar brushes, hind tarsi similar, basitarsus longer, hind tarsus about half as long as tibia; hind coxae narrow, about half as wide as the femora, and narrower than first sternite behind coxa (this elongate often forming in the middle more than half the length of the abdomen); hind femora strongly incrassate, unicarinate beneath, with a strong tooth and a denticulate crista extending from it toward the apex, or with several strong teeth near apex, hind tibiae arcuate dorsoventrally, with a median longitudinal ventral channel bounded by strong ridges, obliquely truncate at apex, ventral apex produced into a strong trowelshaped spine; elytra elongate, convex, narrowed and deflected at apex, covering base of pygidium, or in *Caryopemon* and *Diegobruchus* less convex, little deflected and narrowed at apex, not covering base of pygidium.

None of the species referred to *Pachymerus* Latreille by Schoenherr and his associates or other authors before 1913, except *Pachymerus pandani* Blanchard 1845, are members of the Pachymerinae as thus described. They are, in general, Bruchinae and some but not many fall into *Andromisus* Gozis 1881 (*Pseudopachymerus* Pic 1913).

TRIBES OF PACHYMERINAE.

The tribes of the Pachymerinae may be distinguished by the following table in which the order is from the specialized to the generalized forms:

1. Head elongate, malar space longer than broad, temples strongly produced behind the eyes; eyes finely facetted, emarginate for half their length; pronotum less flattened, lateral margins depressed, its hind margin semicircularly produced between the elytra; front coxae contiguous at apex or narrowly separated; scutellum minute; elytra flattened with humeral calli prominent, not much narrowed apically nor bent down, not covering the base of pygidium.....*Caryopemini*, new tribe (*Caryopemon*, *Diegobruchus*).

   Head short, malar space not longer than broad, temples not produced; eyes coarsely facetted, emarginate for one-fourth or less of their length, strongly projecting; pronotum flatter, not produced semicircularly between the elytra; scutellum larger; elytra convex, elongate, narrowed and deflected apically, covering base of pygidium.....2.

2. Carinae and impressed lines of pronotum obsolete on the sides in front; front coxae contiguous at apex, prosternum separating them for not more than one-third their length; eyes barely perceptibly emarginate; joints one and two of tarsi but little expanded at apex.....*Caryedini*, new tribe (*Caryedon*).

   Carinae and impressed lines of pronotum complete, the lines surrounding dorsum; front coxae separated at apex by the sternum; eyes distinctly emarginate but not for more than one-fourth their length, joints one and two of tarsi strongly triangularly expanded.....*Pachymerini*, new tribe (*Pachymerus*, *Caryobruchus*, new genus, *Caryoborus*).

Caryopemon and Diegobruchus.

Jekel 1855 Ins. Saundersiana Curcul. 25–26, gave the most carefully elaborated description of a Bruchid genus which has been published, describing *Caryopemon* and an equally excellent description of the genotype *hieroglyphicus* l. c. 27–29, with the locality "India orientalis." During June, 1925, I collected a large series of the species feeding upon the glands of the young leaves of the scandent *Acacia intsia* at Mormugao, Goa, Portuguese India. This is not the host plant and I could not find the plant in which it breeds. There is before me also an individual of this species from Bandra (a suburb of Bombay),

India, collected by Dr. Jayakar, 1905, 152, which reached the National Museum through the British Museum by way of the Carl F. Baker collection. Another belonging in the collection of the Imperial Entomologist of India, kindly lent to me for study with other bruchid material by T. Bainbrigge Fletcher, Imperial Entomologist, was collected at Chicacole Road, Madras Presidency, by P. V. Isaac, 8, vii, 24. These are the only locality records known to me for the species.

Stephens 1839 Man. British Col. 265, described *Caryoborus cruciger* "from red West India seeds: evidently imported." It was figured by Spry and Shuckard 1840 British Col. Delin. Suppl. Pl. 6, f. 2, and referred to *Caryopemon* by Pic 1913 Col. Cat. 55:9, with the locality indication "England (eingeschleppt), Indien, Afrika." I have elsewhere (Journ. Washington Acad. Sci. 15:80, 1925) recorded it as bred from seeds of *Abrus precatorius* by Le Doux, Cape Province, Union of South Africa. Since then two additional lots have come to the National Museum secured from the same plant from Africa by inspectors of the Federal Horticultural Board. I know no other records of the habits of any of the species, all of them Indo-Maylayan, Mascarene, or Ethiopian.

While many important characters force us to place *Caryopemon* in the Pachymerinae, it shows many resemblances to *Andromisus* Gozis 1881 as represented by the genotype *Bruchus brasiliensis* Thunberg 1816. Whether these resemblances indicate affinity or convergence requires further study to determine. The species show much divergence and may not belong together. Pic 1912 Échange 28:110, has laconically established the "new genus *Diegobruchus* (for the old *B. suarezicus* Pic 1904 Échange 20:35), near *Caryopemon* and very distinct by the prothorax strongly inclined in front, concealing the head from above, hind femora strongly incrassate, pluridentate, the tibiae strongly arcuate." When the characters of *Diegobruchus* are further elaborated some species of *Caryopemon* may, perhaps, be placed there. There are no records of the habits of any species of *Diegobruchus* which are all Mascarene or East African.

Caryedon and its Genotype.

The first species of the Pachymerinae was described by Geoffroy 1762 as *Mylabris* 2, without a specific name. Goeze 1777 Ent. Beytr. 1:332, based *Bruchus fuscus* upon this description. Subsequently this species has received many names because the descriptions are inadequate; it utilizes a large number of leguminous host plants over an extraordinary range of distribution and is much more than ordinarily variable. Olivier 1790 Encycl. Meth. Ins. 5:199, described it under two names,

Bruchus pallidus and *Bruchus serratus*, as collected by the younger Geoffroy in Senegal. Schoenherr in Isis von Oken 1823: 1134, cited *serratus* as the genotype of his undescribed genus *Caryedon*, a valid and available genonym under the International Code of Zoological Nomenclature, and a proper genotype fixation. Bedel 1901 Faune Col. Bas. Seine 5:341, after comparing the types made *serratus* a synonym of *fuscus*, indicating that both types had been collected by the younger Geoffroy in Senegal. The name of the genotype therefore is *Caryedon fuscus* (Goeze) new combination. If my present interpretation of the species and its synonymy is correct some 19 or more specific names have been applied to *Caryedon fuscus*, of which we need to mention here only *Bruchus gonagra* Fabricius 1798 Ent. Syst. Suppl. 159, and *Bruchus* (*Caryoborus*) *languidus* Gyllenhal 1839 in Schoenherr Gen. Curc. 5:129, names much used for the species. It is found throughout the Old World tropics and subtropics and has become established in Hawaii (recorded 1908), Jamaica (1916), Fiji (1921), and now Haiti (1928). The other species are found in the Old World and the only records of habits, besides those of *fuscus* under one name or another, are by Skaife 1926 South African Journ. Sci. 23:579, recording the attacks of *interstinctus* Fahraeus upon the seeds of *Acacia giraffae* in South Africa and Blanchard's account of his problematical *Pachymerus pandani*.

Caryedon? pandani (Blanchard).

Blanchard 1845 Hist. Ins. 2:114, pl. 10, f. 5–8, described from Madagascar *Pachymerus pandani* as "from five to six mm. long, and entirely grayish." To this brief description may be added his diagnosis of *Pachymerus:* "Hind femora much inflated, multidentate. Tibiae arcuate. Antennae long, a little serrate." The figures show that the insect was reared from *Pandanus* and is a bruchid of the subfamily Pachymerinae, possibly a *Caryedon* or an undistinguished genus near it. He refers to it 1845 Ann. Soc. Ent. Faunce (2) 3: iv, as *Bruchus pandani* and indicates that it may have originated in Bourbon. Pic 1913 Col. Cat. 55:11, places it in *Pseudopachymerus*.

The Genera of Palm Bruchids (Pachymerini).

The genotypes of *Pachymerus* and *Caryoborus* are not congeneric, these genonyms are therefore available for two genera. The genera are arranged from the more generalized, to the more specialized forms. That part of the armature of the lower margin of the hind femora occurring before the great tooth, is referred to, if present, as made up of serrations; that beyond it as denticles; they are not much unlike in some species.

1. Hind tibiae with two small unequal calcaria at apex beneath; antennae serrate from fourth joint or from third in one male, basal joints not impressed at base; hind femora with the great tooth before the middle, margin before it not serrate; crista beyond it with from ten to sixteen denticles; hind tibia evenly arcuate, without a tubercle beneath near base, received against the femur between the great tooth and crista within toward apex and a not very prominent subbasal angular process without ..
Caryoborus.

Hind tibiae without calcaria ..... 2.

2. Antennae serrate from fourth joint (except in *veseyi* in which they are subfiliform), basal joints not impressed; hind femora with the great tooth beyond the middle, margin before it serrate, crista with six to ten denticles, hind tibia receiving the serrations of hind femur in its ventral channel and lying outside the great tooth and crista as in *Caryoborus*, but lacking the subbasal process of femur ..... *Caryobruchus* new genus.

Antennae serrate from the fifth joint, joints 2, 3, 4, and sometimes others impressed at base; hind femora with the great tooth near base, margin before it not serrate, margin beyond hardly cristate, with ten or more denticles more or less hidden in pubescence, lower margin apically emarginate, the apical denticles, one at the beginning of the emargination and one or two in the emargination more tuberculate than the others; hind tibia abruptly bent near base, with a tubercle beneath at the bend, shallowly channeled above within and without, these longitudinal channels bounded by weak ridges (in addition to the ventral channel), received against the femur within and alongside the denticles and great tooth ..
Pachymerus.

Caryoborus Schoenherr (Restricted).

As restricted by the description here given, *Caryoborus* includes *Bruchus serripes* Sturm 1826, *Caryoborus priocerus* Chevrolat 1877, *Caryoborus chiriquensis* Sharp 1885, and perhaps other species. The material of the genus in the National Museum seems to fall into but two species, all of it from the continent of South America. *Chiriquensis* was described from Panama and probably occurs there naturally, though all the material we have from Panama was secured in quarantine, in commercial ivory palm nuts from Equador, in which there is a considerable export through Panama. It may be that what I have considered as *serripes* consists of more than one species but I have been unable to find any certainly significant differences between the darker material from Bolivia and from French Guiana and the more rufescent material from Brazil. Probably *priocerus* is synonymous with *serripes*. The species may be separated thus:

1. Denticles of hind femur about 16; humeri strongly asperate; antennae unlike in the sexes, joint three widened in male and not in female, joint 11 in

male thrice as long as broad, twice as long as broad in female, mesosternum abruptly bent toward the plane of metasternum.....*serripes*.

Denticles about 12; humeri feebly asperate; antennae alike in the sexes, joint three narrow, joint 11 about twice as long as broad; mesosternum gradually curved back toward the plane of the metasternum....*chiriquensis*.

Caryoborus serripes (Sturm).

Sturm 1826 Cat. Ins.—Samml. 74, tab. III, fig. 28, described and figured this species "aus Para in Brasilien" without indication of host plant as *Bruchus serripes* and Boheman 1829 Nouvelle Mem. Soc. Nat. Moscou 1:117–118, independently described it under the same name attributed to Hoffmannsegg on the authority of Schneider in Litt., from the Schoenherr Collection, saying doubtfully "habitat in America meridionali." Schoenherr 1833, designated it as "typus" of his Grex *Caryoborus* in *Bruchus*, a proper genotype designation, according to the International Code. Pic 1913 Col. Cat. 55, referred it to *Pachymerus*.

In the National Museum is a series of a *Caryoborus* with the palm seeds from which they issued which have remained unidentified since 1878. The infested seeds were brought to Theodore Pergande by Mr. Smith of the Botanic Garden and reared out by him, several larvae working in a single seed. Careful study of Sturm's descriptions and figures and Boheman's description convince me that they are *Caryoborus serripes*. The seeds were referred to O. F. Cook and C. B. Doyle of the Bureau of Plant Industry and determined as those of a species of *Astrocaryum* and in all probability from Brazil as originally indicated by Mr. Smith. The indication of *Elephantusia* [*Phytelephas*] *macrocarpa* as host plant for this species by Letzner 1878 Jahresb. Schles. Ges. 55:195–198, is doubtless due to confusion with the similar, still undescribed *Caryoborus chiriquensis* Sharp 1885. Other material in the National Museum determined as this species, is a series collected by William Schaus on the Maroni River, French Guiana, in 1904; one individual intercepted in quarantine at Washington, D. C., by E. H. Dusham, then of the Federal Horticultural Board, in palm nuts from Para, Brazil, accompanied by a fragmentary beetle and fragment of palm nut from which it issued, considered by Mr. Doyle as probably that of a *Maximiliana;* and one individual collected by M. R. Lopez in February at Ivon, Beni, Bolivia, while with the Mulford Biological Expedition of 1921 and 1922.

Caryoborus chiriquensis Sharp.

Caryoborus chiriquensis Sharp 1885 Biologia Centr. Amer. Col. 5:504, pl. 26, f. 13, was described from the Volcano Chiriqui,

Panama. A series in the National Museum derived from the Chittenden collection, bears a locality label Ecuador 5990. and another indicating they had been determined as this species by Dr. Sharp; two individuals are labelled Ivory nuts, Pier 7, Cristobal, C. Z., Oct. 26, 1918, H. F. Dietz Coll.; a series bear the label Zetek 1436, in Ivory nuts, Baranguatal, Ecuador. Under this number in the files of the Bureau of Entomology is the following note by Mr. Zetek: "Given me by Mr. H. K. Plank who collected it in April, 1921, and thought it was a good nut. Was going to send it to his people in the United States, I believe. The entire inside was reduced to powder, pupal cells and weevils. There were thirty-one adult weevils present, each in a cell by itself, filling the entire nut cavity." J. W. Douglas, 1876, Trans. Ent. Soc. London, 1876:xiv, xvi, reported a *Caryoborus*, presumably the present species, as seriously affecting the weight of a shipment of the Corozo nut (*Phytelephas macrocarpa*) on the London docks, imported from Guayaquil. "As there were several larvae in each nut the interior was completely destroyed." As before indicated, Letzner's record of the Ivory nut being attacked by *Caryoborus serripes* refers to this species. Schilsky's notes and description under *Caryoborus serripes* 1905, Käfer Europa's 41: G and 1906 op. cit. 43: no. 28, as imported into Hamburg from Central America also seem to refer to this species.

CARYOBRUCHUS, new genus (Genotype *Dermestes gleditsiae* Linnaeus).

The material of this genus to the National Museum is separable into fifteen species, of which only *veseyi* (Horn), *gleditsiae* (Linnaeus), and *curvipes* (Latreille) may be recognized with reasonable certainty as described.

This is the most widely distributed palm bruchid genus, with numerous species on the continent from the Carolinas to Argentina and in the West Indies, being the only genus definitely known to be represented in the United States and the West Indies. It is also more divergent than the other genera with two rather well defined groups besides the somewhat isolated *Caryobruchus veseyi*. The group of smaller species, so far as they have been associated with host plants, breed in the seeds of the palmettos and palms having similar drupaceous fruits with hard seeds lacking a differentiated soft kernel, mainly Sabalaceae Cook. The group of larger species breed in the oily kernels of palms in which the soft kernel is differentiated from the hard shell inclosing it, the shell covered with a pericarp and epicarp, sometimes soft and fleshy, often fibrous (Cocoaceae Cook). The former group includes the smallest species of the palm bruchids and the latter the largest, indeed

the largest of all Bruchidae. *Caryobruchus giganteus* is described as reaching 29 mm. in length, while some individuals of *C. gleditsiae* of the smaller group collected by H. S. Barber on Big Pine Key, Florida, do not exceed 5 mm. in length.

The two groups may be distinguished by the form of the gula, *veseyi* agreeing with the smaller species in this character. The larger species have the eyes somewhat approximate beneath and the gula is abruptly narrowed between the eyes with its sides there parallel; in the others the eyes are less approximate beneath and the sides of the gula converge posteriorly. The larger species, so far as the fourteen individuals at hand represent the group, are all fifteen mm. or more in length. The carina of the hind femur beneath is incised before the great tooth with about six incisions forming flattened serrations; in the smaller species, the serrations are less flattened, more distinct, even and more numerous. In the larger species the antennal joints are longer and more slender, the apical joint being three times as long as broad; the apical joint in the smaller species is about twice as long as broad; in *veseyi* it is similar to those of the larger group but the other joints are still more slender than in those species and hardly serrate. Except in *veseyi* and two undescribed smaller species the elytral humeri are smooth or at most microscopically asperate; in these they are asperate as in *Pachymerus*. In the larger species the pronotum is angulate on the sides near the apical third, much more so than in any of the smaller species. The coarse punctures on the dorsum of pronotum are fewer than in the smaller species and grouped into a mediolateral and posterodiscal group on either side, those of the former group usually not extending forward beyond the lateral angulations. Most of the species have the antennae, more or less of the front and middle legs and the tibiae and tarsi of the hind legs reddish testaceous or yellow, contrasting with the darker reddish coloration of the body. In the males the first joint of the front and middle legs are very evenly inflated and expanded from base to apex with the lateral margins evenly rounded out and about twice as long as broad. Some of the smaller species have this joint similarly inflated but in them the joint is shorter and broader.

The large *Caryobruchi* are represented in the National Museum by six forms, presumably species, but their status and relationship to four species names in this group can not be determined until ampler material is available and comparison with the types of *ruficornis*, *giganteus*, *donckieri* and *revoili* can be made. No authentic material of any of these species is found in this country. Since but two of these forms are present in both sexes and the material of two of them show distortion from unnatural conditions during transformation,

more satisfactory material for type series of new species might well be desired. Nevertheless, characters to distinguish species in this group seem to be present and have not been brought forward before. I have therefore ventured to describe and give names to these six forms, recognizing that some of them may be synonymous with species previously described.

Table of the Species of Caryobruchus with the sides of the gula between the eyes parallel, not converging posteriorly.

1. Sides of pronotum strongly angulate, somewhat concave between this angulation and the posterior angles ..... 2.
   Sides of pronotum less strongly angulate, nearly straight from the angulation to the posterior angles ..... 4.
2. Apex of mesosternum abruptly bent, the bent apex as long as broad, lateral sulcus of pronotum punctate ..... 3.
   Apex of mesosternum gradually bent back toward the plane of the metasternum, lateral sulcus of pronotum not visibly punctate, mediolateral punctures about 15, extending forward beyond the angulation, posterodiscals about 14 (11–16); Colombia from seeds of *Scheelea excelsa;* length from anterior margin of pronotum to apex of elytra, 17–18 mm. ..... *scheeleae*, new species.
3. Basal portion of mesosternum subvertical, surface subgibbous at the bend; pygidium about as broad as long, broadly rounded at apex (slightly produced in ♀), a little convex (more convex in ♂); punctures of lateral sulcus few, not extending forward beyond the angulation, mediolaterals about four, posterodiscals about seven; Brazil from babassu nuts; 15 mm. ..... *lipasmatus*, new species.
   Basal portion of mesosternum more oblique, surface not gibbous at the bend; pygidium longer than broad, but little convex, broadly truncate in both sexes (narrowly produced in ♀); punctures of lateral sulcus more numerous, extending forward beyond the angulation; mediolaterals about 16 (9–21); posterodiscals about 20 (10–40); Panama, Venezuela; 13–18 mm. ..... *buscki*, new species.
4. Punctures of lateral sulcus coarse, in more than one series, encroaching on the surface above the sulcus, fine punctures of pronotum in front well impressed and numerous, extending across near the front margin from one group of mediolaterals to the other; denticles about seven, not flattened, four basal well separated, three toward apex more or less confused and indefinite; Uruguay, from the seeds of *Acrocomia* sp.; 12–13 mm. ..... *acrocomiae*, new species.
   Punctures of lateral sulcus finer, in a single series, not encroaching on the surface above, fine punctures in front few and feebly impressed, not noticeable in the middle near the front margin ..... 5.
5. Pronotum with an anterodiscal group of a few well impressed punctures within the mediolaterals, finer than these and coarser than the fine puncture; denticles as in *acrocomiae;* Para, Brazil, from seeds of *Attalea* sp.; 14 mm. ..... *pararius*, new species.

Pronotum without anterodiscal moderate punctures; denticles about 12, flattened, crista much elevated; from palm nut, probably *Astrocaryum* sp. from Brazil; 15 mm..... *pergandei*, new species.

Caryobruchus scheeleae, new species.

Brownish red, antennae, front margin of clypeus, labrum, palpi and tars yellowish testaceous, everywhere covered with fine appressed brownish cinerous pubescence somewhat obscuring the surface sculpture, everywhere micropunctulate; eyes separated by about one-fourth the width of clypeus; front narrow anteriorly, arcuately wider behind, carinate, carina continued behind as an impunctate line to the contraction of the head above, supraorbital furrows subreticulately punctured; temples broadly and shallowly sulcate parallel to the contraction; pronotum strongly angulate, posterior angles produced and subacute, sides between this angle and the anterior angulation parallel and slightly concave, dorsum with scattered shallow scarcely perceptible fine punctures and mediolateral and posterodiscal groups of coarse well impressed punctures of varying size and number, mediolaterals in the type 9 on the right, 14 on the left, in the paratype 16 on the right, 13 on the left, posterodiscals in the type, 10 on the right, 11 on the left, in the paratype, 14 on the right, 15 on the left, flanks not perceptibly punctured; scutellum about as broad as long, strongly emarginate at apex; humeri micro-asperate, striae slightly but distinctly impressed except the marginal (10th) stria which is strongly impressed basally, punctures of striae irregularly disposed, intervals flat, not perceptibly punctured; femoral serrations 6–8, basal two acute and distinct, apical serrations obtuse and ill-defined, denticles 8-9 a little confused toward apex, inner carina of hind tibia beneath more elevated than outer; pygidium of male (female unknown) about as broad as long, broadly truncate with rounded angles, convex longitudinally, not very coarsely nor closely punctured, nearly impunctate broadly on the median longitudinal line, with coarser well impressed punctures toward the middle on either side; hypopygium about as long as the preceding sternite, its margin sinuate, somewhat produced in the middle; length 17–18 mm.

Described from two males, one (type) labelled as bred in Feb., 1917, from seeds of *Attalea* sp. from El Banco, Bolivar, Colombia (F. H. B. no. 18575), received July 29, 1916, and heavily fumigated; the other (paratype) was received from R. S. Beagles, then in charge of the Plant Introduction Gardens of the Bureau of Plant Industry at Chico, California, and labelled as "ex *Attalea* nut probably from El Banco, Colombia, 24–6–16, Curran.

The seeds of this palm were collected as indicated by Mr. H. M. Curran at El Banco, Colombia, and have been determined as those of *Scheelea excelsa* by Mr. Doyle as recorded in Inventory of Seeds and Plants Imported 48:14, no. 43055, 1921, from which this note is quoted. "Fruit drupaceous, edible, ovoid, apiculate, about the size of a duck's egg; pericarp mucilaginous, oily, intermixed with fibers; epicarp leathery,

yellow; seeds bony, one to three celled. Grows in hot valleys of the Magdalena and Canea." The seed from which the paratype emerged is preserved in the National Museum. It is two chambered and the larva had eaten one of the kernels. Each of the chambers is about 1.5 in. in length by .5 in. in diameter; the enclosed kernel is very oily, nearly cylindrical, and covered with a fragile brown membranous coat. The exit hole of the bruchid is 9 mm. in diameter and leads to a pupal chamber about 20 mm. long. This is closed at base by a layer about 5 mm. thick composed of a substance like rotted sawdust and is lined with a brownish cement which is not very noticeable. The rest of the chamber is filled with a substance like that compacted to form the basal wall of the pupal cell. This is the débris resulting from devouring the kernel.

Caryobruchus lipasmatus, new species.

Closely resembling *C. scheeleae* with these differences besides those indicated in the table: Front and middle tibiae also reddish testaceous as well as the parts described as yellowish testaceous in *scheelei*, exact color probably not significant but dependent on maturity and state and manner of preservation; denticles of hind femur 11–12, confused toward apex; inner carina of hind tibia not more elevated than outer; scutellum less strongly emarginate; pygidium rather evenly, finely and sparsely punctured except upon a subtriangular nearly impunctate area on either side toward base; 15 mm. long.

Described from two individuals reared in Dr. Back's office and labelled "bred from babassu nuts shipped to New York from Para, Brazil, Stored Product Insect Investigations, Washington, D. C., December, 1928." One of these is a female type, the other the male allotype; there is another female paratype which was reared by H. L. Sanford from "coco" palm nut brought to this country from Estado do Maranhao, Brazil, in October, 1915, by Dr. E. C. Green, then in the Brazilian agricultural service. The adult beetle emerged in May, 1916. F. H. B. no. 5488. I have been unable to secure a determination of the species of palm from which this individual was reared. This paratype is imperfect, lacking the hind legs and is somewhat distorted from unnatural conditions during transformation.

Caryobruchus buseki, new species.

Closely resembling *C. scheeleae* with these differences in addition to those indicated in the table: Most of the head above in front of the neck, front and middle legs and hind legs except indefinite infuscate markings on femora reddish testaceous, less contrasting with the color of the body; scutellum less strongly emarginate; femora serrations more definite apically; inner carina of hind tibia not more elevated than outer; 13–18 mm. long.

Described from four female and one male individuals, with one exception from Panama, one paratype from Venezuela; type female, Tabernilla, Canal Zone, July 31, 1907, August Busck; allotype male, La Chorrera, May 17, 1912, Busck; paratype female, same data except May 10; paratype female Barro Colorado Island, 1929, Phil Rau 7565; paratype female, Caracas, Venezuela, H. Pittier, June, 1923, no. 495.

Named in honor of August Busck, the eminent microlepidopterist, whose name must be linked with the entomological exploration of Panama. This is one of many interesting Bruchidae collected by him in this work.

Caryobruchus acrocomiae, new species.

Much less closely resembling *C. scheeleae* with these differences besides those indicated in the table: Form more compact; clypeus palpi and all the legs except darker markings on the hind femora reddish; scutellum less strongly emarginate; pygidium more coarsely and irregularly punctate, with lateral subbasal subimpunctate areas; denticles of hind femora seven; 12–13 mm.

Described from two males, a type and paratype intercepted in quarantine at Washington, D. C., in seeds of *Acrocomia* sp. from Uruguay, Nov. 9, 1921, by W. T. Owens, F. H. B. no. 40378.

Caryobruchus pararius, new species.

Closely resembling *C. scheeleae* with these differences in addition to those indicated in the table: Color of antennae, labrum and legs not contrasting with body color; sternites 1–4 with apical margin infuscate contrasting with the basal portion; scutellum very slightly emarginate; inner carina of hind tibia not more elevated than outer; 14 mm. long.

Described from one female type intercepted in quarantine at Washington, D. C., April 19, 1918 (F. H. B. no. 24247), in a palm nut from Para, Brazil, D. A. Tower, identified for me by Mr. C. B. Doyle as that of an *Attalea*, one of the oil palms, with a very hard shell and two rather small oily kernels.

Caryobruchus pergandei, new species.

Closely resembling *C. scheeleae*, with these differences besides those indicated in the table: Coloration darker, perhaps due to age or condition of preservation, labrum partly yellowish, partly reddish, margin of clypeus paler red, antennae reddish, with no other marked color contrast with body color; some peculiarity of disposition of the pubescence along the elytral striae gives an effect of alternating color to the naked eye which disappears under the lens; 15 mm. long.

Described from one female type with the old Department of Agriculture no. 1036 P. In 1878 this insect was brought as a larva to Theodore Pergande in a palm seed, apparently the same as the Brazilian *Astrocaryum* from which *Caryoborus serripes* was bred, by Mr. Smith of the Botanic Garden. In 1880 Mr. Pergande noted finding the emerged beetle and preserved the present type which has remained undescribed until now. It is named in honor of Pergande to help keep alive the memory of a pioneer in the Bureau of Entomology. Apparently a single larva emerged from a single kernel of the nut, as appears to be the case with all these species of *Caryobruchus*.

Caryobruchus ruficornis (Germar 1818), new combination.

Germar 1818 Mag. Ent. 3:1—7, tab. 1, f. 1–4 described and figured *Bruchus ruficornis*, its larva and pupa and the seed from which it had been secured by Zincken in Brunswick from palm nuts, which Germar supposed to be those of *Bactris minor* Jacquin from the West Indies. The figure, however, shows the seed of one of the oil palms very much larger than those of *Bactris*. In the same volume, p. 463, he refers his species to *Bruchus curvipes* Latreille 1811, in which he was certainly in error. His species was the first of the large *Caryobruchi* to be described and his description of the larva was the first detailed[1] description of a bruchid larva. His error of determination has been universally followed and all subsequent literature of *Bruchus curvipes*, and particularly its larva, has been based on this or one of the related large species of *Caryobruchus*.

Other Caryobruchi of the Group of Large Species.

The following species from the descriptions seem to belong in the group of large species of *Caryobruchus* with the sides of the gula between the eyes parallel, not converging. As has been said, I have not been able from the descriptions to make out whether any of these specific names or *Caryobruchus ruficornis*, represent species distinct from those here described or from each other. Pic's two species do not seem to be synonymous.

[1]Herbst 1784 [Borowsky] Gemein. Naturgesch. Thicerr. 6:102–3, and Kurze Einleit. z. Kenntn. Insekt. 102–103, described briefly the larva of *Pachymerus nucleorum* as that of *Bruchus bactris* and Boddaert 1770 Dierkundig Mengelwerk Stuk 5:12–23, f. 9–13 describes in the Dutch language and figures a palm bruchid and its larva obtained for him by Heer L. Juliaans, able apothecary, presumably in Flushing, from a South American palm nut used by the button makers. Everything suggests *Caryoborus chiriquensis* in the ivory palm nut but we can not be quite sure.

Caryobruchus giganteus (Chevrolat) new combination.

Caryoborus giganteus Chevrolat 1877 Ann. Soc. Ent. France (5) 7: xcviii Bahia.
Pachymerus giganteus (Chevrolat) Pic 1913 Col. Cat. 55: 7 Brasilien.

Caryobruchus donckieri (Pic) new combination.

Caryoborus donckieri Pic 1899 Le Naturaliste 21:21 Brazil.
Pachymerus donckieri (Pic) Pic 1913 Col. Cat. 55:7 Brasilien.

Caryobruchus revoili (Pic) new combination.

Caryoborus revoili Pic 1902 Le Naturaliste 24:172 Paraguay.
Pachymerus revoili (Pic) Pic 1913 Col. Cat. 55:8 Paraguay.

Species of Caryobruchus With the Sides of the Gula Converging Between the Eyes.

The species of this group with one exception, develop in the seeds of Sabalaceae which are without differentiated kernel and hard outer shell; an undescribed species in the National Museum is said to have been reared from a Mexican *Chamaedorea* of another family but with somewhat similar seeds. Nine species are represented in the collection, of which I am reasonably certain of the identity of three species. These four following names appear to apply to species of this group but I can not definitely associate any of them with the remaining six species of the collection:

Caryobruchus testaceus (Motschulsky) new combination.

Caryaborus testaceus Motschulsky 1874 Bull. Soc. Nat. Moscou 46^2:246–247.
Pachymerus testaceus (Motschulsky) Pic 1913 Col. Cat. 55:8 Nicaragua.

Caryobruchus rubidus (Chevrolat) new combination.

Caryoborus rubidus Chevrolat 1877 Bull. Soc. Ent. France (2) 7: cxiv Mexico, Tutla [Tuxtla, Chiapas] (Boucard).
Pachymerus rubidus (Chevrolat) Pic 1913 Col. Cat. 55:8 Mexico.

Caryobruchus recticollis (Chevrolat) new combination.

Caryoborus recticollis Chevrolat 1877 Ann. Soc. Ent. France (2) 7: cxv Venezuela, Caracas (Langsberg).
Pachymerus recticollis (Chevrolat) Pic. 1913 Col. Cat. 55:8 Venezuela.

Caryobruchus sparsepunctatus (Pic) new combination.

Caryoborus sparsepunctatus Pic 1913 Le Naturaliste 24:172 Brazil.
Pachymerus sparsepunctatus (Pic) Pic 1913 Col. Cat. 55:8 Brasilien.

Caryobruchus gleditsiae (Linnaeus), new combination.

Johanssohn 1763 Amoen. Acad. 6:392 described the first and second species of Bruchidae affecting palm seeds as *Dermestes*

gleditsiae and *bactris*, usually cited as of Linnaeus, who referred them to *Bruchus*, 1767 Systema Naturae ed. 12:605. The former species was supposed to breed in the seeds of the honey locust (*Gleditsia triacanthos*) and so received its misleading specific name. It was later described as *Bruchus arthriticus* by Fabricius 1801 Syst. Eleuth. 2:398. Under this specific name it was placed in *Caryoborus* by Schoenherr 1833 Gen. Curc. 1:93 and has since been generally known as *Caryoborus arthriticus*. Pic 1913 Col. Cat. 55:6 called it *Pachymerus gleditsiae*, restoring the first specific name for it in accordance with the rules of nomenclature. It is a common species breeding in the seeds of palmettos in the United States from North Carolina to Brownsville, Texas. I do not know if it occurs elsewhere for some of the records of it occurring in the West Indies are probably based on undescribed species known to occur there. I do not believe that it occurs in Argentina as reported doubtfully by Bruch 1915 Rev. Mus. La Plata 19:432.

Caryobruchus curvipes (Latreille), new combination.

Bruchus curvipes Latreille 1811 in Humboldt et Bonpland Voy. aux Rég. Aequin du Nouv. Cont. 1:234–236, pl. 16, f. 5, 6, was described from Serrullo,[1] Nouvelle Espagne [Mexico] from the seeds of an unknown species of palm brought back to France for planting. Every one of these seeds was found to contain one of these Bruchids. The seeds are from the figure certainly those of *Inodes* or *Sabal*. The figures and description make it certain that this species is very closely allied to *gleditsiae*. Latreille gives the size as 14 mm. but says figure 5 is somewhat enlarged, yet it measures only 15 mm. Probably then the actual measurement is less than 14 mm. I have considered as representing this species a series bred from the seeds of an undetermined *Inodes* collected by G. N. Collins Dec. 26, 1907, at San Bartolome, Chiapas, Mexico, and another series received in Washington, June 2, 1919, from S. Calderon, who bred them from an undetermined native palm in San Salvador. The largest individual of both these series measures about 12 mm. in length and they resemble closely large individuals of *gleditsiae* bred from *Inodes texana* Cook from near Brownsville, Texas. They may be distinguished by the more nearly vertical mesosternum which is not noticeably bent back toward the plane of the metasternum. I do not think that Latreille's species has been interpreted correctly since its description, owing to the confusion between it and *ruficornis*.

[1]Serrullo is a missprint probably for Jorullo, the great volcano of Michoacan, Mexico, where Humboldt and Bonpland travelled.

Caryobruchus veseyi (Horn), new combination.

Caryoborus veseyi Horn 1873 Trans. American Ent. Soc. 4:313 was described from the Cape Region of Lower California. There is a series of this species in the National Museum bred from the seeds of a palm collected in January, 1906, by the late Dr. J. N. Rose on the Sierra de la Laguna and with it a single seed of the palm. This was determined for me by Dr. O. F. Cook as that of an *Erythea*, probably *Brandegeei* Purpus. Since *Erythea Brandegeei* is the only species of the genus known from the Sierra de la Laguna or indeed from the whole Cape region of Baja California, doubtless it is the host plant. Neither host plant nor insect is known except from that region.

PACHYMERUS Thunberg.

The genus *Pachymerus* is less widely distributed than *Caryobruchus*, all the material in the National Museum being from the mainland of the American continent except that from the island of Trinidad and a single specimen from Jamaica (perhaps only intercepted there). The most northerly material is from the state of Jalisco in Mexico and the southernmost from Paraguay. The species form a very compact group with most of the characters common to all. The differences by which the species may be separated are found in the structure of the hind femora, in differences in details of puncturation and in the impressions of the antennae. Since these characters have not been described for the named species I can not recognize with certainty any of those "described." The details described here and those given in the table are general to the material in this genus. It is hardly to be expected that some exceptions will not be found.

Form elliptical, strongly bent down in front and behind; piceous black, clypeus, labrum, and sometimes legs and elytra in part rufescent, integument in general micropunctulate and with not very coarse punctures on clypeus except at apex, front, neck, dorsum and flanks of pronotum, striae of elytra, pygidium, hind femur especially above at base and apex, metepisternum, and the sternites; in general covered with cinereous, olivaceous, or brownish appressed pubescence, denser beneath, but little concealing the surface sculpture, except toward apex of front and middle tibiae, on the denticulate edge of the hind femur and on the plantar surface of tarsal joints one to three.

Head short, strongly contracted above and on the sides behind the eyes, malar space not longer than broad, temples gradually declivous to the contraction, not produced, not sulcate; eyes coarsely facetted, emarginate about one-fourth, strongly projecting; pronotum about as long as broad or shorter, arcuately narrowed in front near the apical third, lateral margins somewhat depressed, sulcus punctate, coarser punctures of dorsum not assembled in distinct groups, denser and coarser toward the sides, flanks strongly and rather coarsely

punctured, pronotum not much produced between the elytra, posterior margin nearly straight except for the median lobe, prosternum transversely carinate behind the coxae at the summit of the posterior face; mesosternum gradually bent back toward the plane of the metasternum; scutellum quadrate, more or less emarginate behind; elytral humeri asperate, punctures of striae coarser and more rounded basally, finer, more elongate, and less impressed toward apex, striae not strongly impressed, intervals flat; hind femur without serrations, denticles 10–12; hind tibia punctate dorsally; pygidium subvertical, covered at base by the decurved apices of elytra, about as broad as long, rounded at apex or subtruncate, nearly plane in female, plane or longitudinally convex and inflexed at apex in male, sternites transversely sulcate at base with a depressed translucent apical margin, hypopygium not longer than sternite four, narrowed in the middle in male.

The species of this genus which have been reared use seeds of the size of a filbert or larger, usually the seeds of Cocoaceae, but do not seem to correspond in size with the seed in which they develop. None of the species are as small as the smallest *Caryobruchi* and only one species approaches the size of the larger ones. The species are not so numerous as in that genus.

The genus *Pachymerus* is represented in the National Museum by 170 individuals which I have been unable to separate into species to my own satisfaction. My tentative arrangement separates them into six species, of which I have assigned old names to two. Reference of any of the remaining four (or more) species to any of the extant species names would be mere guess work for the descriptions to not even permit them to be assigned to the genus *Pachymerus* with certainty. Latreille's complaint of the difficulties he encountered in determining palm bruchids is as just to-day as when he published it, a hundred and eighteen years ago, in 1811. "The embarrassment one encounters in the determination of species comes from the greater part of the descriptions being very incomplete and from the authors being more attached to speaking of colors than of characters of form." I have separated the material by the characters exhibited in the following partial table, which should serve to distinguish the one species to which I wish to apply a new name.

1. Marginal and sutural intervals of elytra with more condensed and paler pubescence contrasting with the surface between, upper margin of hind femur in female in an even curve from base to apex, hind femur in male more elongate, with a sinuate basal crista nearly at right angles to the remainder of the upper surface and continued dorsally beyond the base of the longitudinal portion so that this is emarginate basally, apical denticles two, pygidium plane in both sexes ..... *luteomarginatus*.

Pubescence of elytra not differentiated on the sutural and marginal intervals ..... 2.

2. Basal portion of upper margin of hind femur abruptly bent, more strongly so in the males.....*bactris* and another species.
   Upper margin of hind femur in an even curve from base to apex, nowhere abruptly bent, pygidium in males inflexed at apex.....3.
3. Apical denticles of hind femur three—one or more species said to have been bred from *Maximiliana*, *Attalea*, *Scheelea*, *Orbignyia*, *Eleis guineensis* and *melanocarpa* and *Areca triandra* from Brazil, Bolivia, Demerrara, Trinidad, Panama, and Jalisco, Mexico.
   Apical denticles two.....4.
4. Labrum and anterior margin of clypeus yellowish, pygidium coarsely, shallowly and irregularly confluently punctured, the median longitudinal line nearly free from coarse punctures especially in the female, Brazil 10 mm.....*Pachymerus* sp.
   Labrum reddish, pygidium more finely deeply and discretely punctured with coarse punctures throughout.....*Pachymerus olearius* new species.

Pachymerus bactris (Linnaeus).

Dermestes bactris Johanssohn 1763 Amoen. Acad. 6:392 was the second palm bruchid described and the first recorded as breeding in the seeds of a palm. Johanssohn in the original description cites Jacquin 1763 Hist. 170 where Jacquin records breeding it from the seeds of his *Bactris minor* brought back to Europe from Cathagena, Colombia, for planting and found infested with this beetle. Linnaeus 1767 referred it to *Bruchus;* Thunberg 1805 Goettinger Gelehrte Anzeiger 29:281 cited it under his monobasic genus *Pachymerus*, establishing it under the International Code with *bactris* as genotype; Gyllenhal 1833 in Schoenherr Gen. Curc. 1:93 referred it to *Caryoborus* Schoenherr, where it remained until Pic 1913 Col. Cat. 55:7 properly restored it to *Pachymerus*. Whether any of the insects referred to in the literature are really Linnaeus' species is doubtful, but material in the National Museum may represent it, since two lots bear labels indicating species of *Bactris* as host plant. It is a *Pachymerus* with the characters indicated in the table.

Pachymerus nucleorum (Fabricius).

Herbst 1783 Fuessly Archiv den Insectenk. (4) 4–5:28 described and figured what he supposed to be *Bruchus bactris* from "East Indian" palm nuts used by the turners in making knobs for canes. He describes the antennae as having three narrow joints which would indicate *Caryoborus* or *Caryobruchus* while his figure resembles the species here described as *olearius*. Fabricius 1792 Ent. Syst. 12:369 named Herbst's species *Bruchus nucleorum* describing the elytra as striate but not punctate, while Herbst had said they were striate with punctures. Schoenherr 1833 referred it to *Caryoborus*, and Pic 1913 to *Pachymerus* where it probably belongs. The identity of this

species is uncertain and more than one species has been referred to under this name.

Pachymerus luteomarginatus (Chevrolat).

Chevrolat 1877 Ann. Soc. Ent. France (2) 7: cvi described *Caryoborus luteomarginatus* from Venezuela, Caracas. It is clearly a *Pachymerus*. Material collected the same day in Panama seems to represent this species and exhibits the peculiar sexual dimorphism indicated in the table.

Other Species of Palm Bruchids in Pachymerus.

The following species of palm bruchids may all be species of *Pachymerus*, where they have been placed by Pic 1913, but the study of types will be necessary before we can be sure:

Caryoborus cardo Fahraeus 1839 in Schoenherr Gen. Curc. 127 Brasilia.
abruptestriatus Gyllenhal 1839 l. c. 128 Brasilia.
lacerdae Chevrolat 1877 l. cvi. Bahia.
rubrofemoralis Pic 1899 Le Naturaliste 21:21 Brazil.

Pachymerus olearius, new species.

Labrum piceous red, shining, transverse, a little produced medially, clypeus black; hind femora with two apical denticles; pygidium of female about as broad as long, plane margined, sides straight, narrowly rounded at apex, coarsely densely and toward base somewhat confluently irregularly punctured with strongly impressed punctures; in the male similar, broader, convex longitudinally, more broadly rounded apically and inflexed. 13–16 mm.

Described from 48 individuals from Brazil: 1 ♀ type, 1 ♂ allotype, 1 ♀ paratype, 7 ♂ paratypes labelled reared from babassu nuts shipped to New York from Para, Brazil, Stored Product Insect Investigations, December, 1928 (from Dr. Back); 1 ♀ paratype and 3 ♂ paratypes from Maranhao, Brazil, F. H. B. No. 5488 with the same history as indicated under that no. for a paratype of *Caryobruchus lipasmatus;* 31 paratypes Para, Brazil, B. Koukoff coll., nuts of *Attalea speciosa;* 1 ♂ paratype ex nuts babassu intercepted in quarantine at New York by H. B. Shaw no. 145; 1 ♀ and 1 ♂ paratype intercepted in quarantine at Washington, D. C., in nuts of *Acrocomia sclerocarpa* from Porto Murtinho, Matto Grosso, Brazil, November 6, 1917, D. G. Tower, F. H. B. 22789.

This is the largest species of *Pachymerus* known to me and is one of the species referred to in literature as *nucleorum*. The babassu nut is the seed of *Orbignyia speciosa* of which *Attalea speciosa* is a synonym as I have been informed by Mr. Doyle.